Cloud Technologies and GIS

An Overview

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Agenda

- What is Cloud Computing?
- How does it work?
- Cloud and GIS applications
- Esri Offerings

Lots of hype

Gartner Hype Cycle for Cloud Computing, 2010

39 Cloud topics of which 75% are either rising or at peak of hype

“Cloud computing remains the latest, most hyped concept in IT”

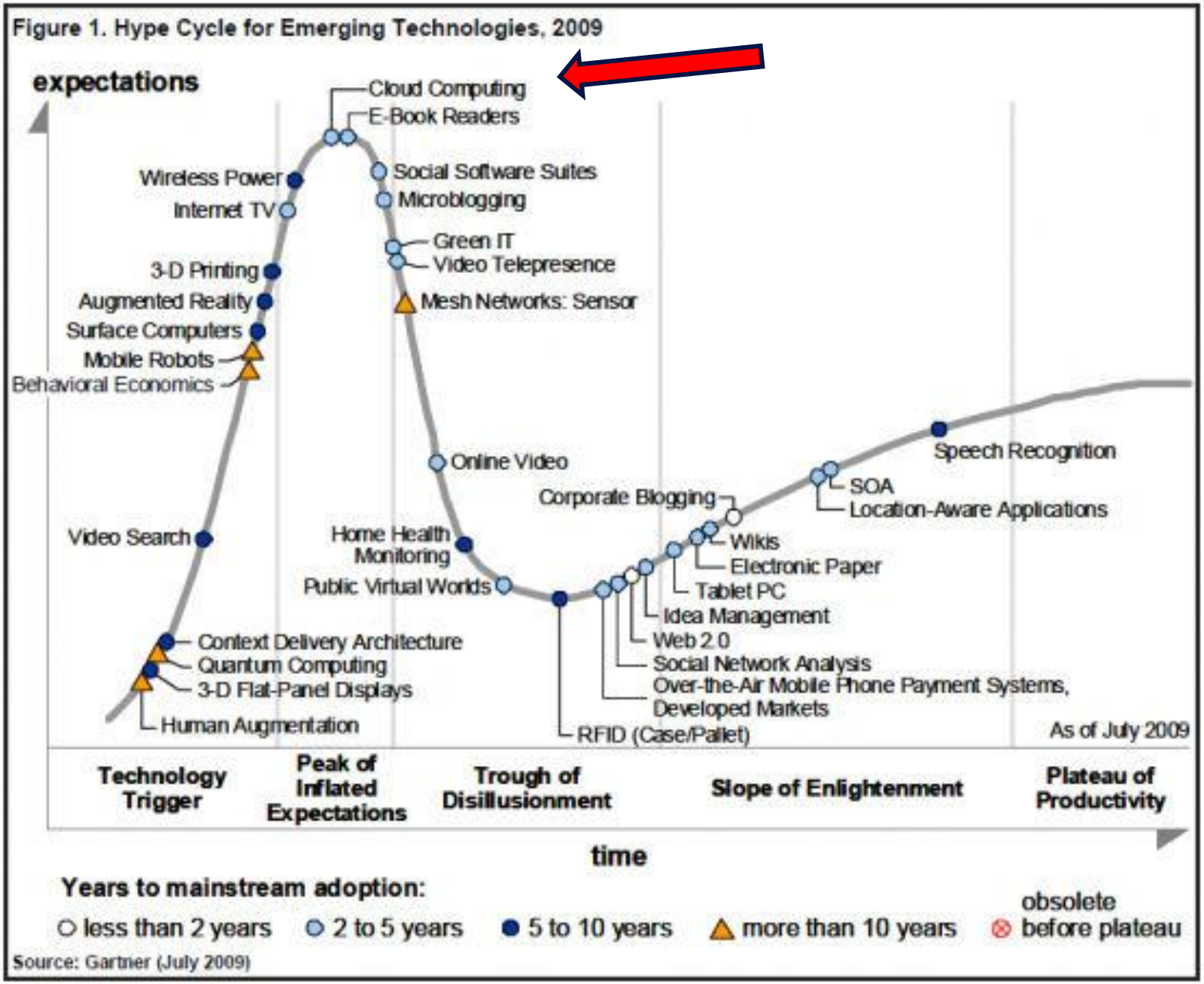
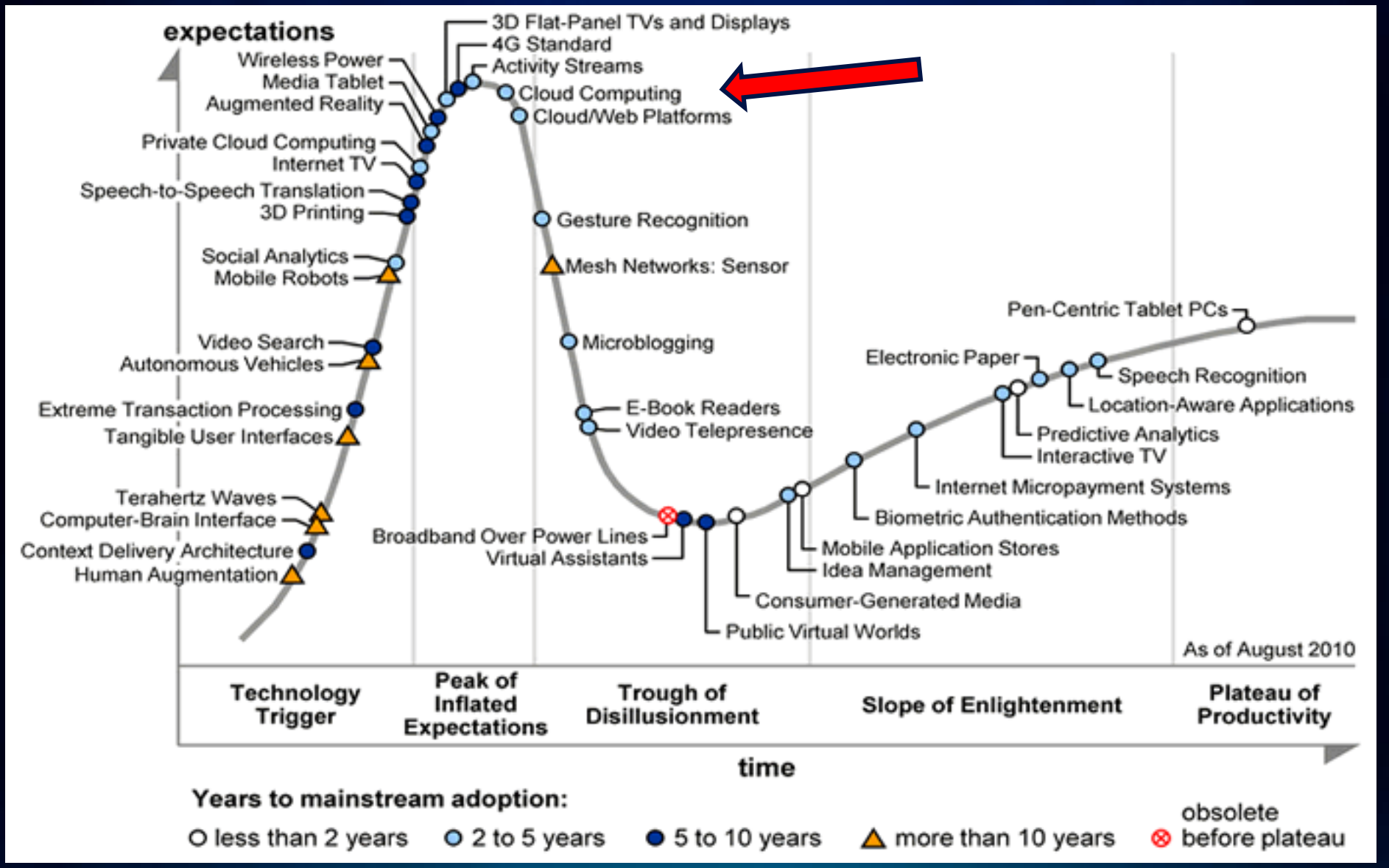


Figure 1. Hype Cycle for Emerging Technologies, 2009
expectations
Cloud Computing
E-Book Readers
Wireless Power
Social Software Suites
Internet TV
Microblogging
Green IT
Video Telepresence
3-D Printing
Augmented Reality
Mesh Networks: Sensor
Surface Computers
Mobile Robots
Behavioral Economics
Online Video
Speech Recognition
Corporate Blogging
SOA
Location-Aware Applications
Video Search
Home Health Monitoring
Wikis
Electronic Paper
Public Virtual Worlds
Tablet PC
Idea Management
Context Delivery Architecture
Web 2.0
Quantum Computing
Social Network Analysis
3-D Flat-Panel Displays
Over-the-Air Mobile Phone Payment Systems, Developed Markets
Human Augmentation
RFID (Case/Pallet)
As of July 2009
Technology Trigger
Peak of Inflated Expectations
Trough of Disillusionment
Slope of Enlightenment
Plateau of Productivity
time
Years to mainstream adoption:
less than 2 years
2 to 5 years
5 to 10 years
more than 10 years
obsolete before plateau
Source: Gartner (July 2009)


expectations
3D Flat-Panel TVs and Displays
4G Standard
Activity Streams
Wireless Power
Media Tablet
Augmented Reality
Cloud Computing
Cloud/Web Platforms
Private Cloud Computing
Internet TV
Speech-to-Speech Translation
3D Printing
Gesture Recognition
Social Analytics
Mobile Robots
Mesh Networks: Sensor
Pen-Centric Tablet PCs
Video Search
Autonomous Vehicles
Microblogging
Electronic Paper
Speech Recognition
Location-Aware Applications
Extreme Transaction Processing
Tangible User Interfaces
E-Book Readers
Video Telepresence
Predictive Analytics
Interactive TV
Terahertz Waves
Computer-Brain Interface
Internet Micropayment Systems
Biometric Authentication Methods
Broadband Over Power Lines
Virtual Assistants
Mobile Application Stores
Idea Management
Context Delivery Architecture
Human Augmentation
Consumer-Generated Media
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more than 10 years
obsolete before plateau

Everybody gets there eventually

People are riding the curve at their own pace, and that's just the way it is. That’s reality, and it's not necessarily a shortcoming that everybody's not seeing it the same way or jumping on board aggressively. Everybody gets there eventually.

Marc Benioff,
CEO of Salesforce.com

InformationWeek, January 21, 2010

Cloud Definition for Today

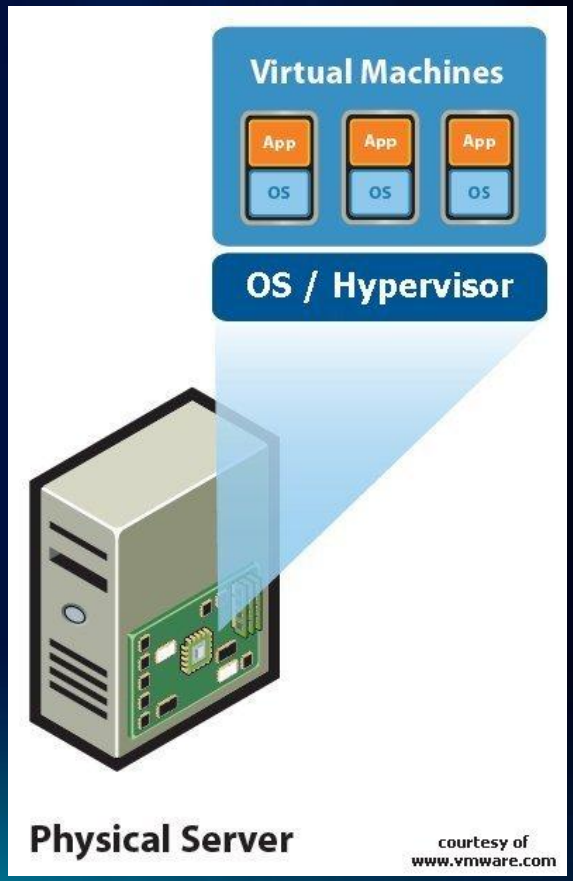
Characterized as: on-demand self-service technology capabilities that are delivered as a metered service via a network.

Consumers of the cloud leverage a multi-tenancy model in an 'elastic' environment.

See NIST cloud definition and characteristics:
http://csrc.nist.gov/groups/SNS/cloud-computing

Virtualization: How it works

- Server virtualization allows the conversion of one server into many virtual machines
- Main components
  - Physical Computer (Host)
  - Host Operating System + Virtualization Component (Hypervisor)
  - Virtual Machines
  - Management Suite + Tools



Multi-tenancy

Virtualized systems that are shared by many companies are often referred to as “Multi-tenant systems

Many clouds, many services…

Cloud Computing Service Models

Software as a Service (SaaS)

End-user applications, delivered as a service, rather than on-premise software

Platform as a Service (PaaS)

Application platform or middleware as a service on which developers can build and deploy custom applications

Infrastructure as a Service (IaaS)

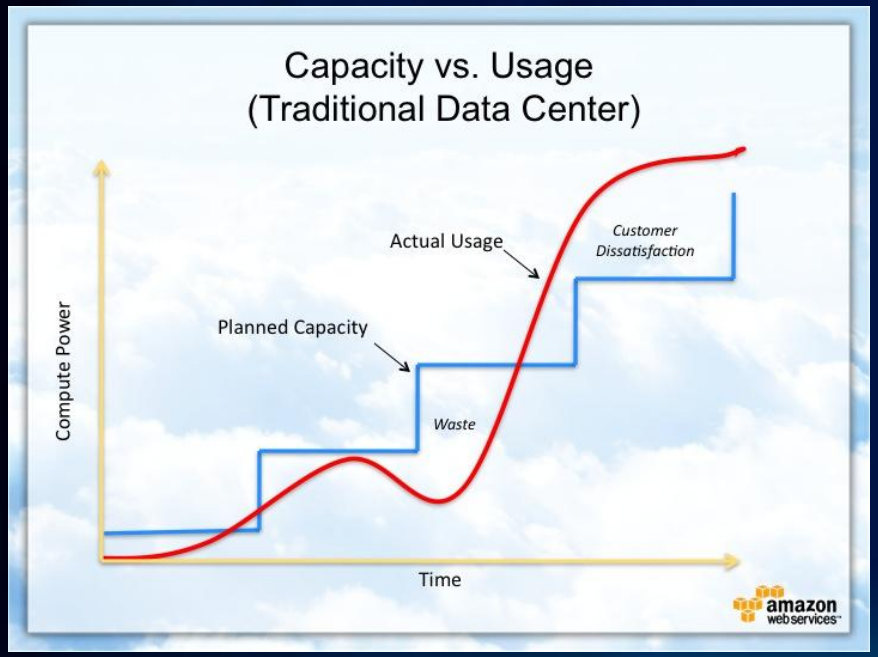
Compute, storage, or other IT infrastructure as a service, rather than as dedicated capability.

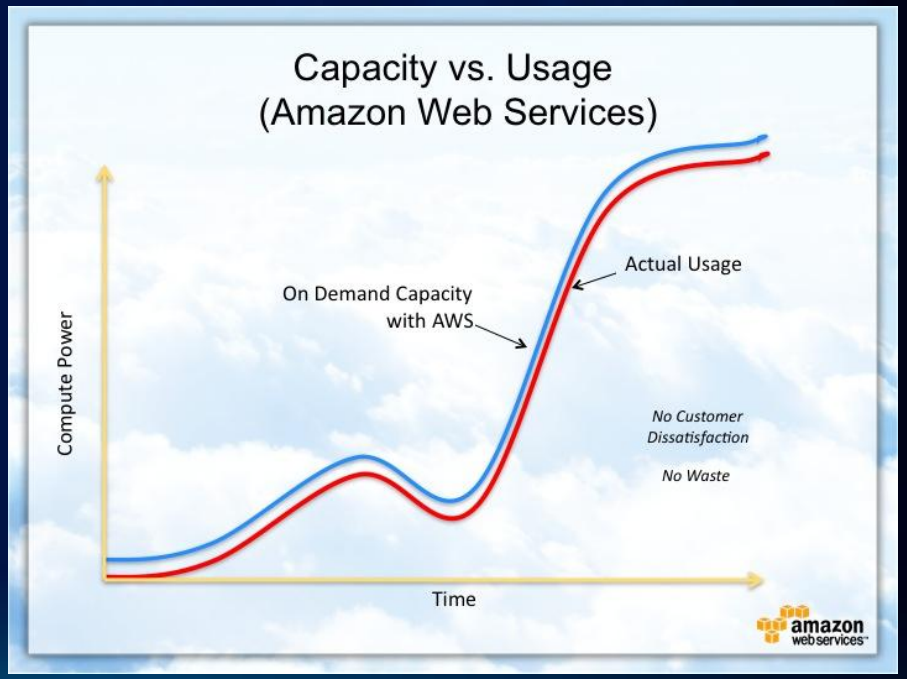
Changes to the Computing Model

Models	Traditional	Cloud
Procurement	Buy assets and build technical architecture	Buy service(s)
Business Model	Pay for fixed assets, overhead, administration	Rent assets; pay based on use
Access	LAN, WAN, client	Ubiquitous Network
Technical	Static and single tenant	Elastic and multitenant

Why the cloud?

- **Reduce costs and improve cash flow.**
- **Minimize your financial and business risks.**



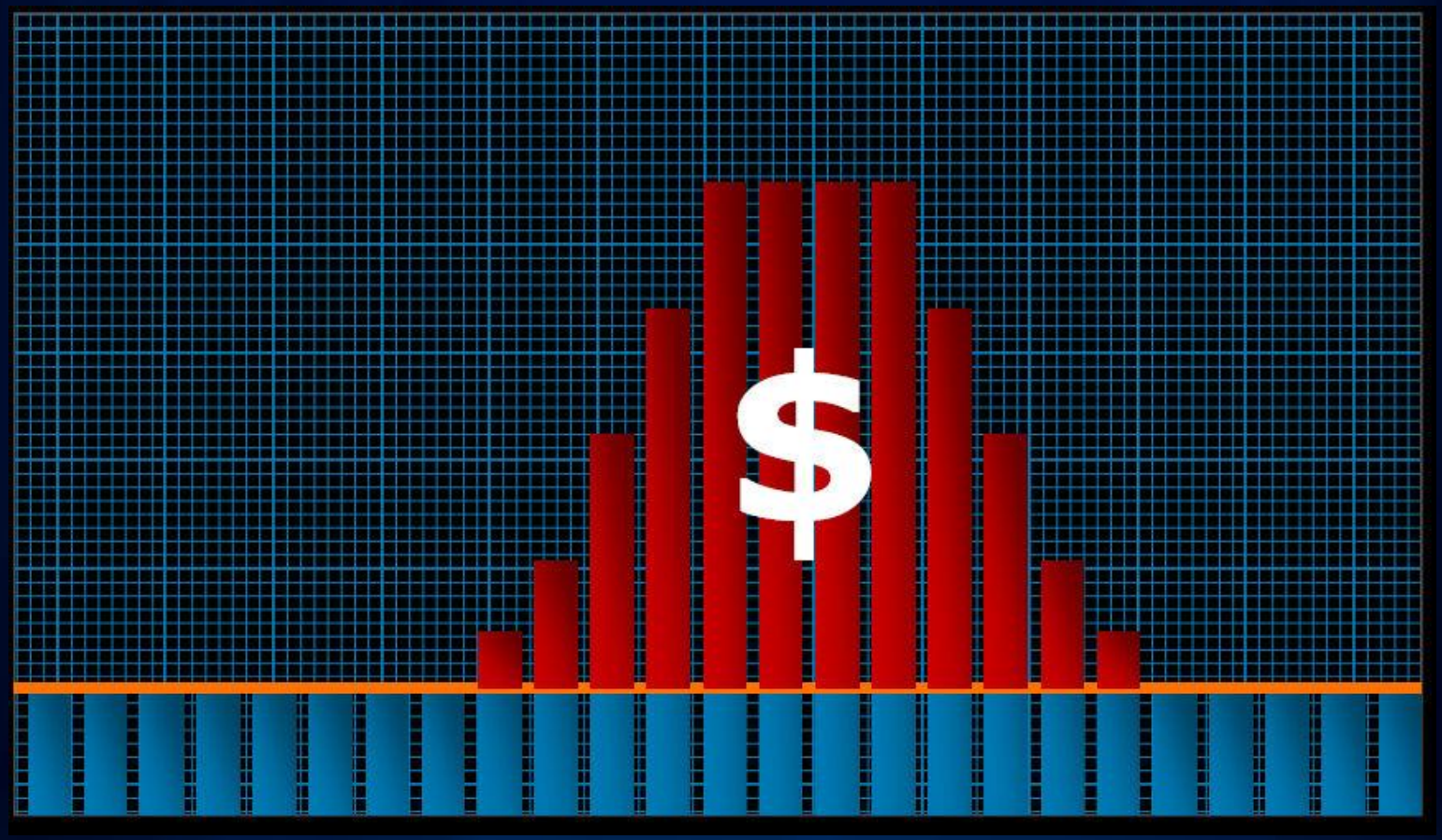


Graphics courtesy: aws.amazon.com/economics

Workload Demand Variation: Building to Peak

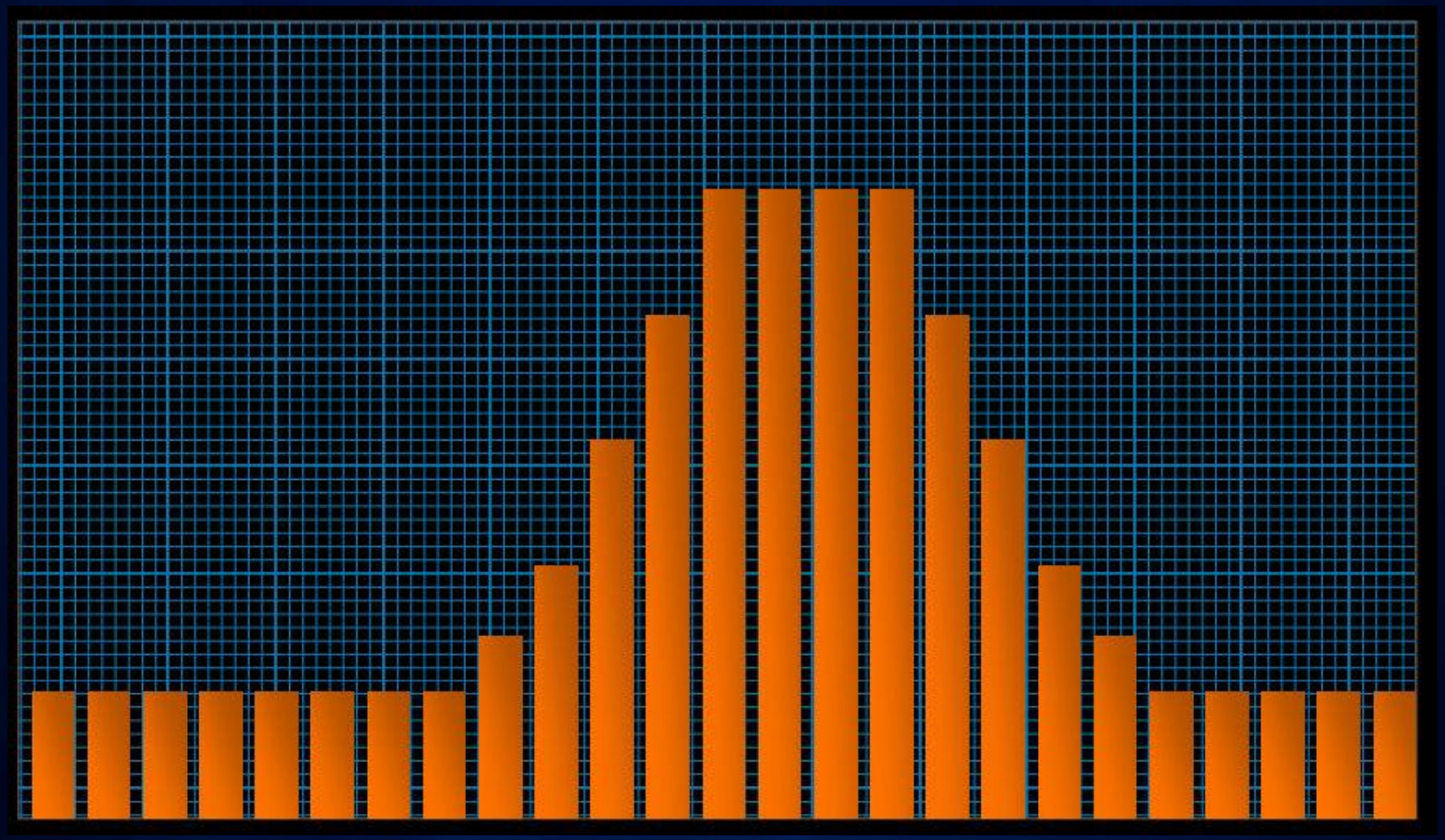
Courtesy: Joe Weinman, AT&T

Workload Demand Variation: Building to Baseline



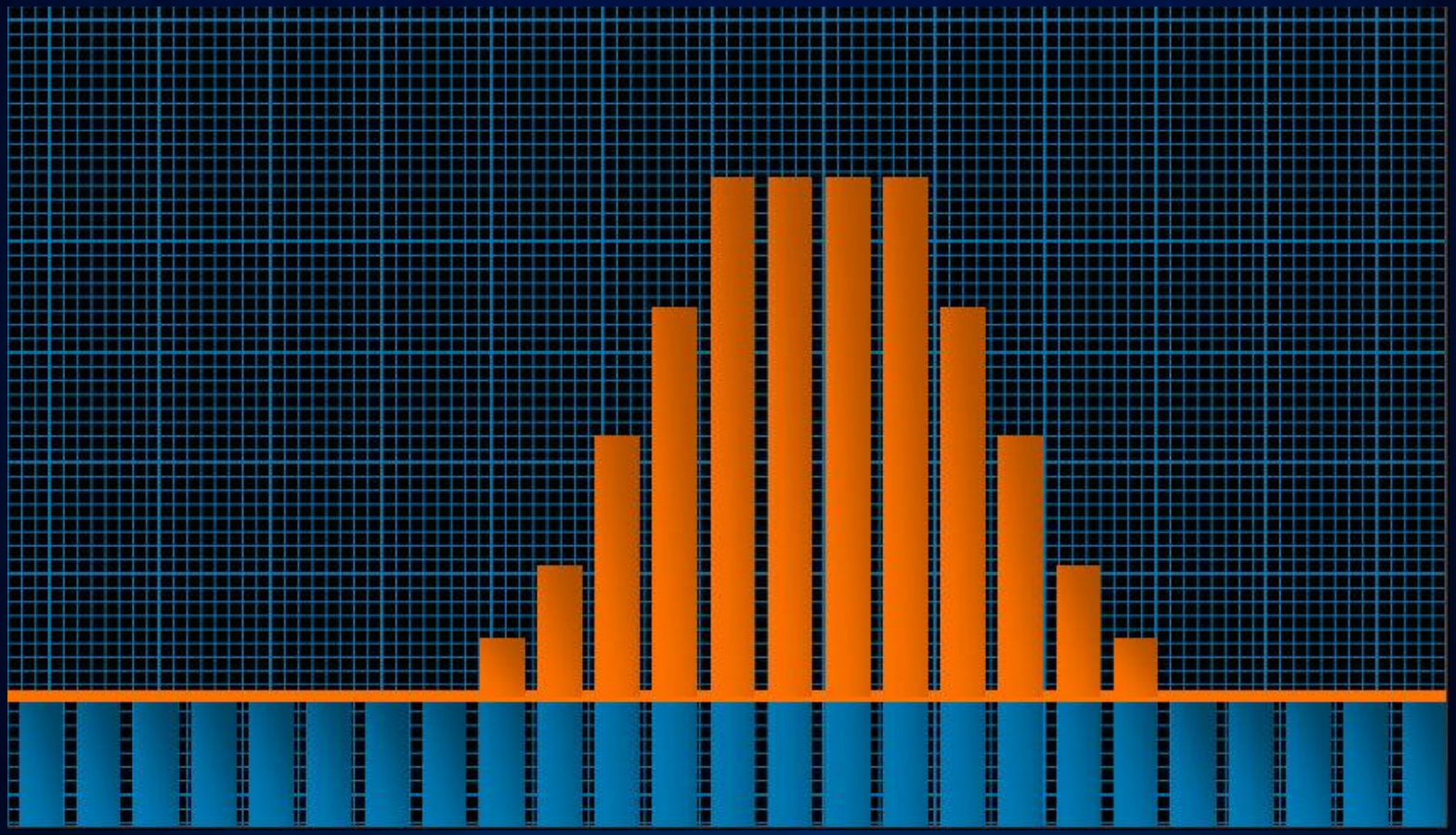
Courtesy: Joe Weinman, AT&T

Workload Demand Variation: Pure On Demand Cloud



Courtesy: Joe Weinman, AT&T

Hybrid: “Own the Base, Rent the Spike”



Quote by Jens Lapinski

Courtesy: Joe Weinman, AT&T

Cloud Benefits

On Demand Self Service	
Frictionless sales	Shorter sales cycle
Friction-free Customer Access	To better meet customer experience
Improved time to market	Competitive advantage
Increased prototyping	Faster output of proof-of-concepts

Cloud Benefits

Ubiquitous Network Access	
Increased Availability	Always on, Always available
Better Support a Global and Mobile Workforce	Attract and Retain Valuable Staff

Cloud Benefits

Measurable Metered Services	
Monitor, control & report resource usage	Provides transparency for provider and cloud consumer
Identifies unpopular/unused applications in portfolio	Streamline application stack
Pay per use	Reduces risk of paying for wasted resources

Cloud Benefits

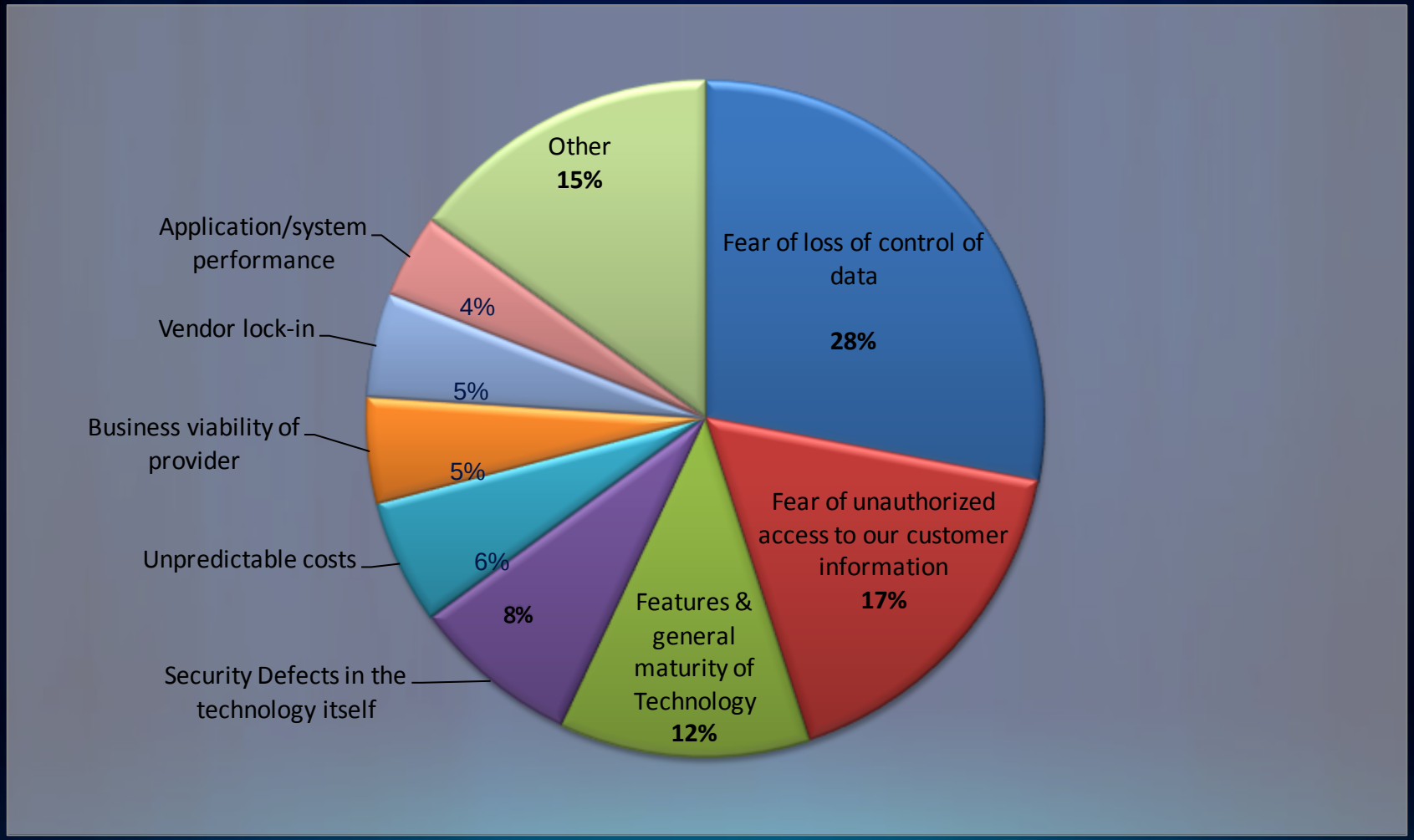
“Elastic” Environment	Resources when you need them
Dynamic provisioning	Meet unpredictable or erratic demand
Extend existing, limited IT infrastructure	Renting assets only when needed
Shift from CapEx to OpEx	Avoid asset expenditures

Cloud Benefits

Other Tangible and Soft Benefits	
More practical support of a global and mobile workforce	Local Installation and maintenance of resources unnecessary
Disaster Recovery, Business Continuity, Failover, Staging	Potentially more viable
Management and Administrative Work Reduced	Responsibility shifts to cloud vendor

Security and SLAs are always a factor

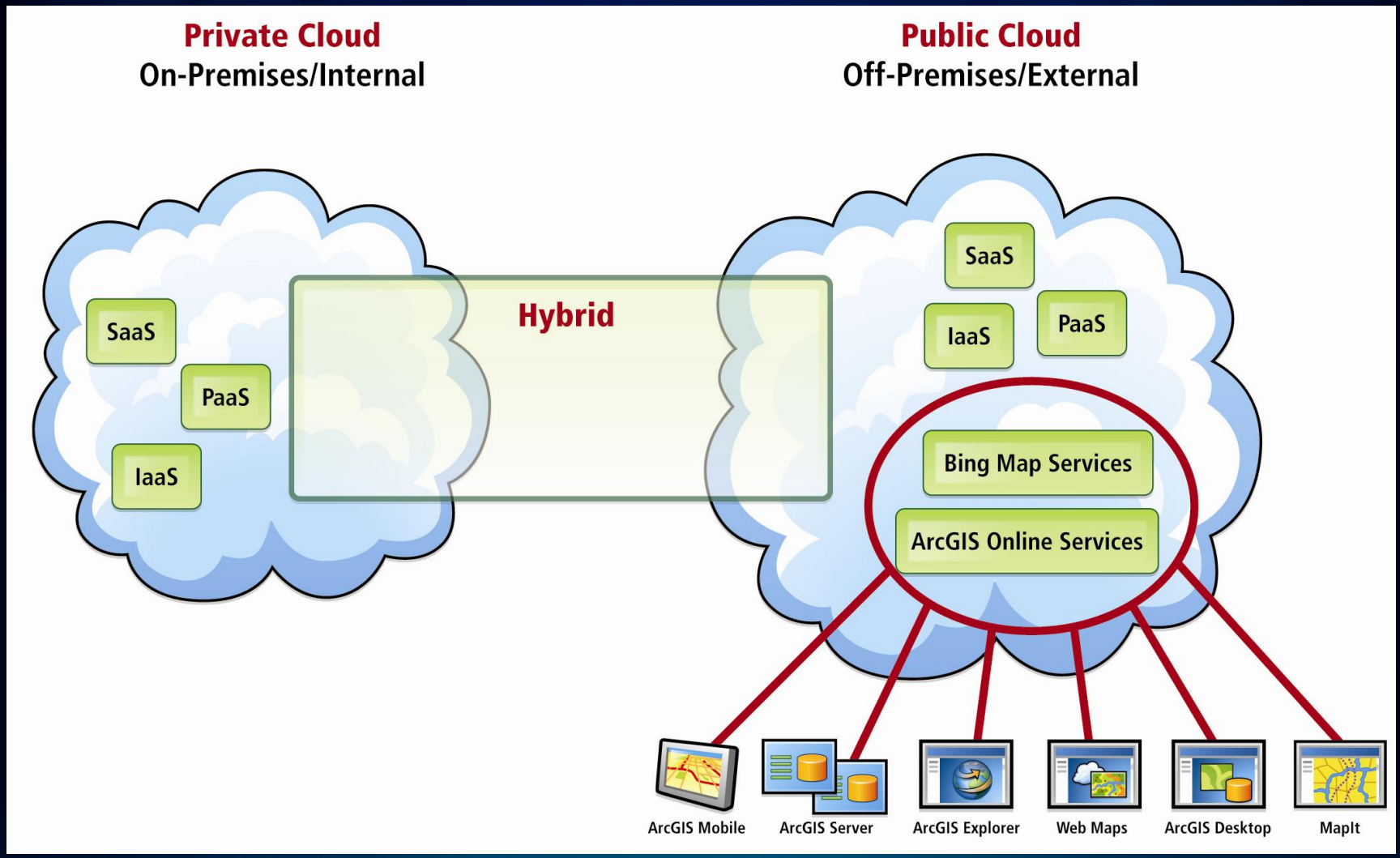
What is the primary reason your organization will not use public cloud services?



Information Week analytics, January 2010

Private and community clouds are very interesting

Cloud Computing Deployment Models



It’s not an all or nothing proposition

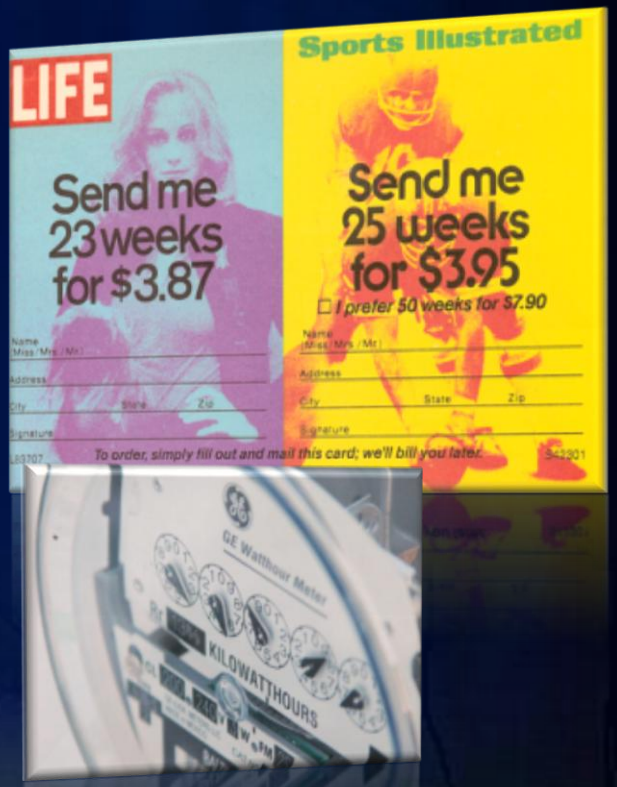
Clear

Partly Cloudy

Cloudy

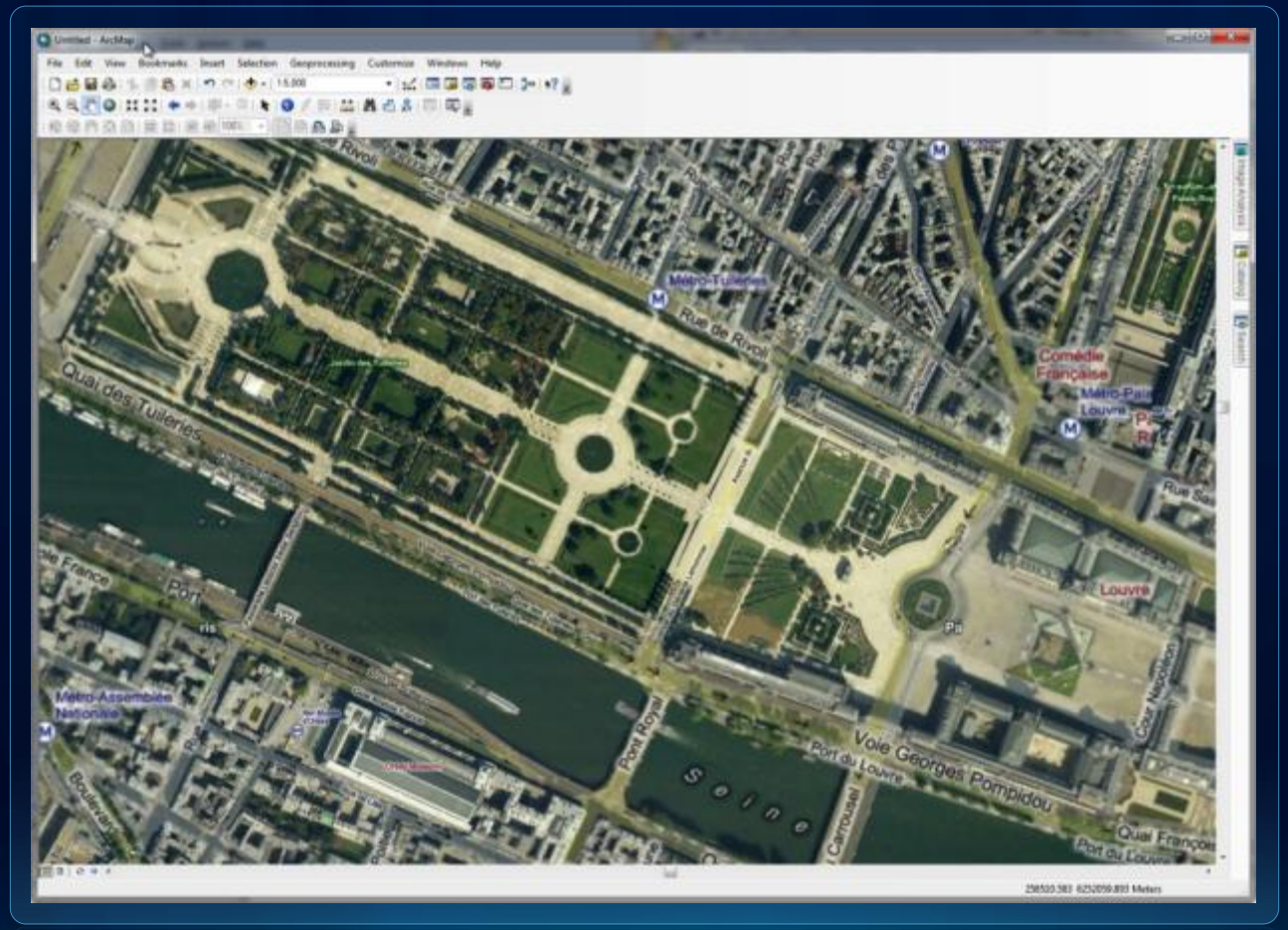
New? Business Models

- **Perpetual**
  Up front purchase plus annual maintenance. A traditional model for buying software licenses and ongoing maintenance.
- **Subscription**
  One fee for the right to use service for a finite period of time. Similar to how you subscribe to a magazine or newspaper.
- **Consumption**
  Pay-as-you-go for what you consume. Similar to how you buy electric and gas service from a utility.



The anatomy of GIS

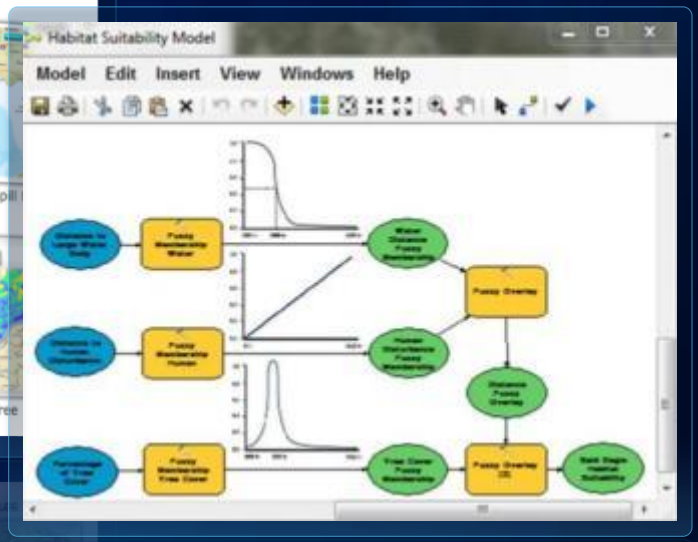
Things that used to cost money are now free



Things that used to be hard to find are now easier

Apps / Code

Analytic Models



Things that used to be complex are now easier

Creating new opportunities

CitySourced

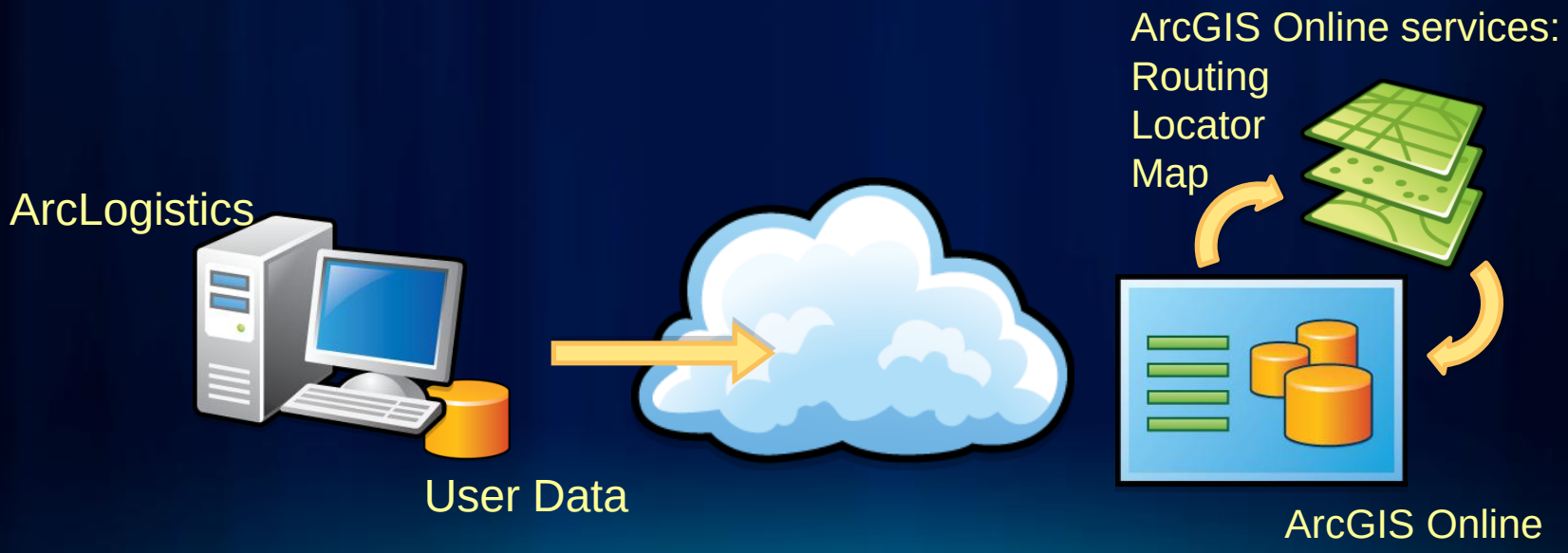
Powering the GeoWeb of the future

Esri Cloud Offerings

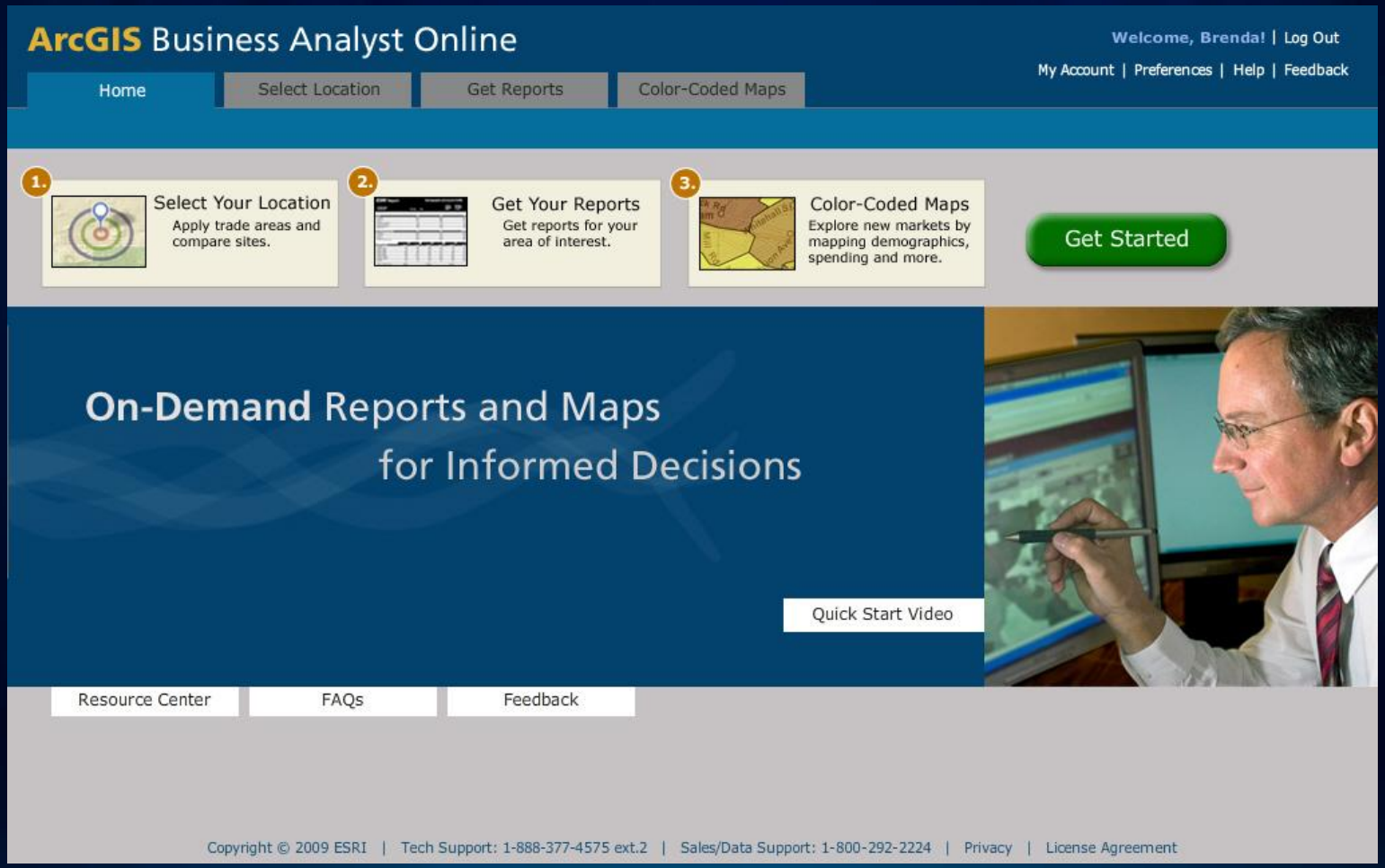
- **Software as a Service:**
  - ArcLogistics Online
  - Business Analyst Online
  - ArcGIS Explorer Online
- **Platform as a Service**
  - ArcGIS.com / ArcGIS Online
  - ArcGIS Web Mapping
  - ArcGIS Server with Cloud Infrastructure
- **Managed Services**

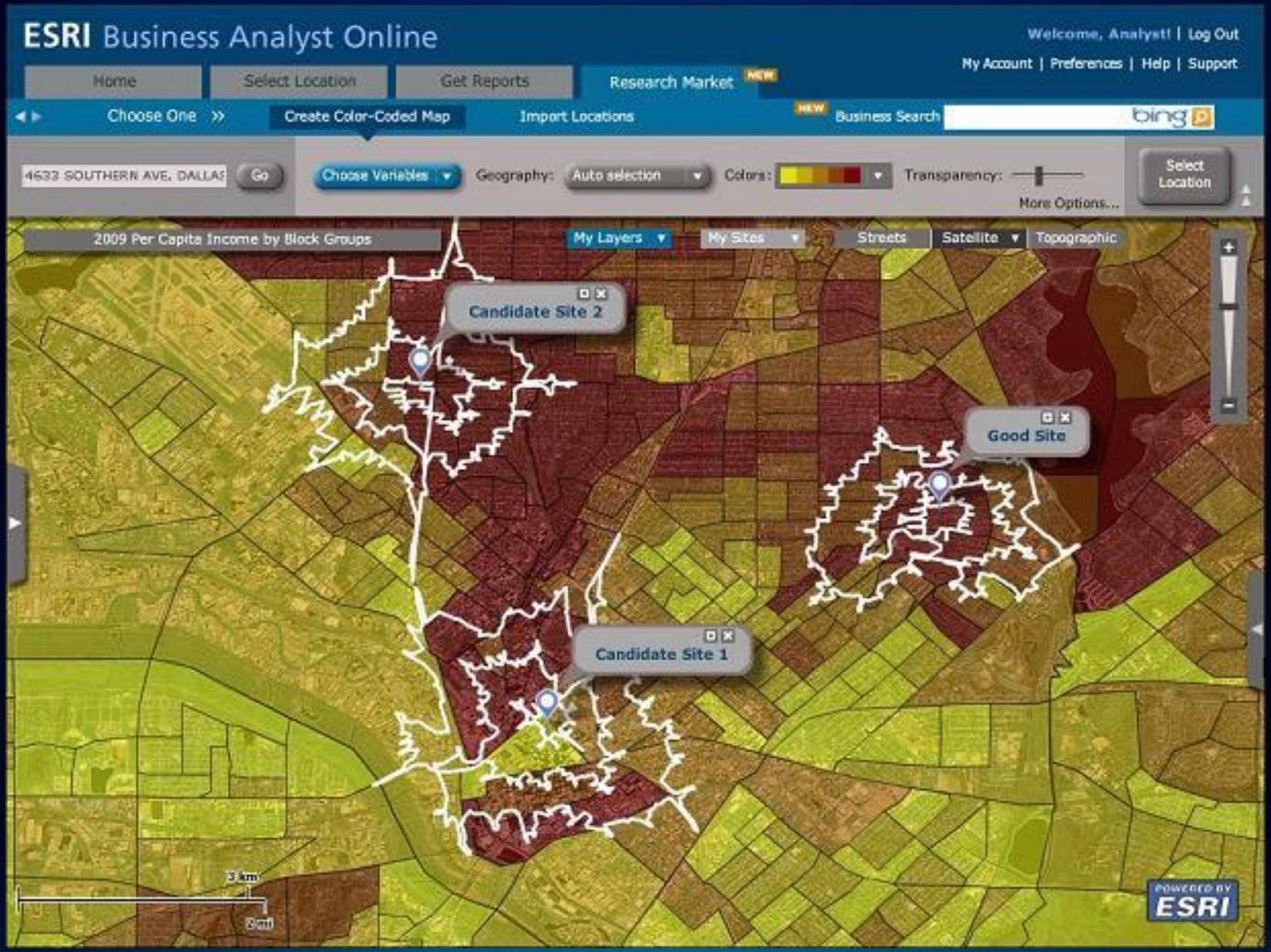
ArcLogistics Online

A rich-client software solution supported by mapping, geocoding and routing services provided by ArcGIS Online. The services are provided in the cloud in support of the client software as a software-plus-services (S+S) model



ArcGIS Business Analyst Online




ESRI Business Analyst Online
Welcome, Analyst! | Log Out
My Account | Preferences | Help | Support
Home
Select Location
Get Reports
Research Market
NEW
Choose One
Create Color-Coded Map
Import Locations
NEW
Business Search
bing
4633 SOUTHERN AVE, DALLAS
Go
Choose Variables
Geography:
Auto selection
Colors:
Transparency:
More Options...
Select Location
2009 Per Capita Income by Block Groups
My Layers
My Sites
Streets
Satellite
Topographic
Candidate Site 2
Good Site
Candidate Site 1
3 km
2 mi
POWERED BY ESRI

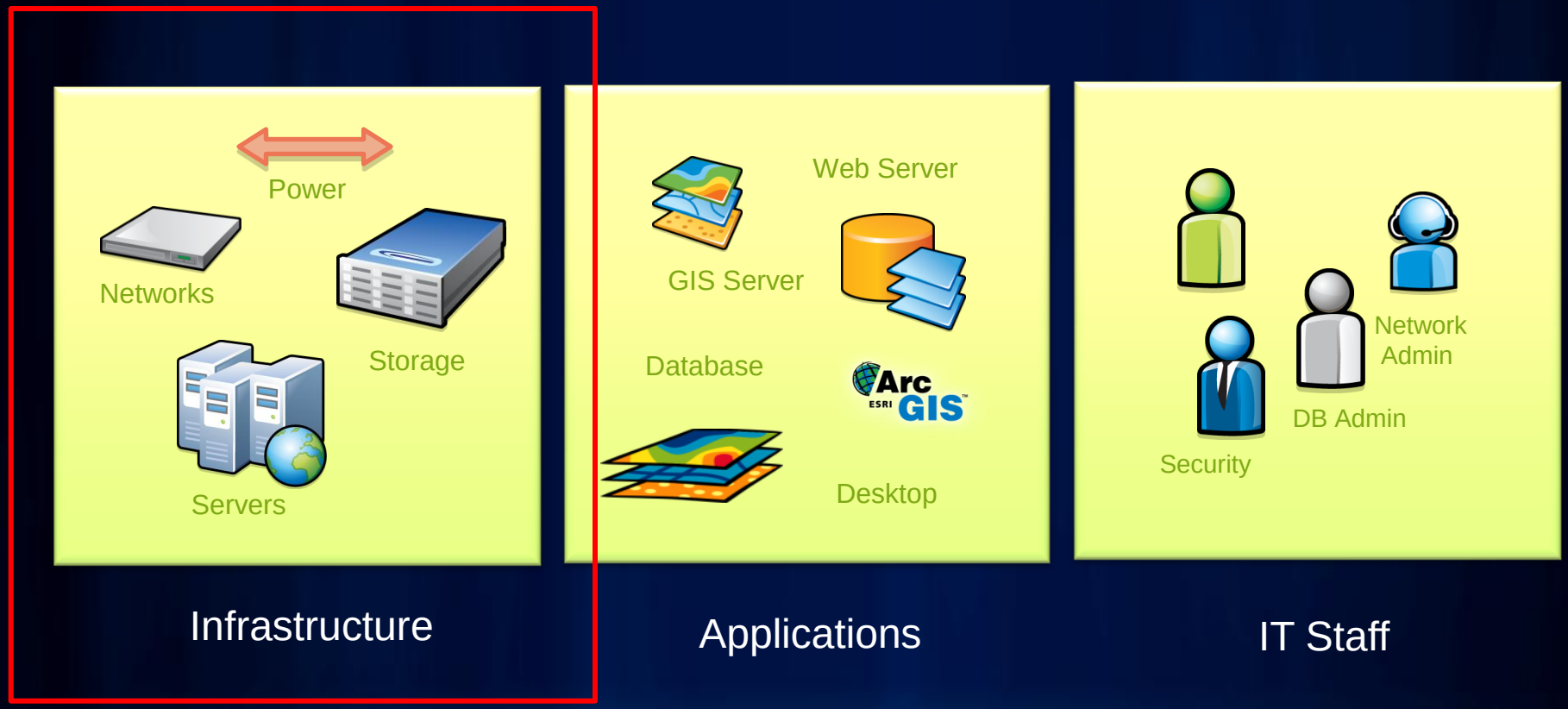
ArcGIS Explorer Online

http://explorer.arcgis.com/

ArcGIS Server

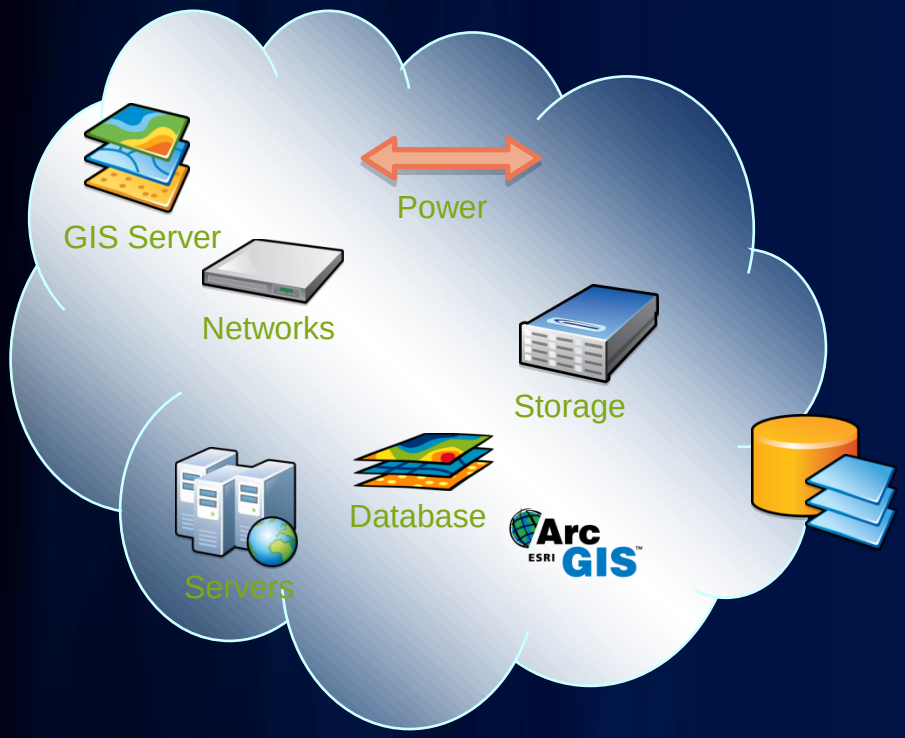
Cloud Offerings

Traditional on-premise deployments



Face increasing costs in their IT infrastructure

Amazon offers an Infrastructure in the Cloud



Infrastructure

IT Staff

Compliments your in-house infrastructure, may result in savings

The Amazon Cloud is an ideal environment

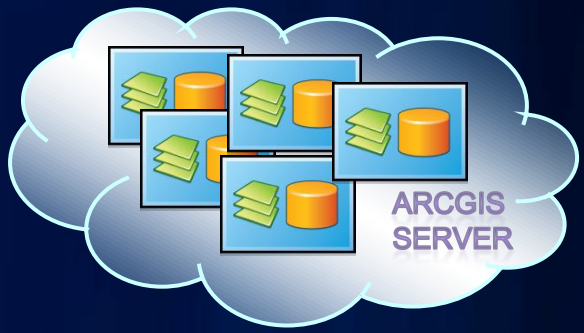
For developing ArcGIS Server applications

- **Saves time:**
  - Access a preconfigured ArcGIS Server instance in minutes
  - No need to allocate a machine within your organization
- **Saves money:**
  - Inexpensive servers available starting at less than a dollar per hour
  - 'Terminate' the dev machine when done (no capital investment)
- **You may deploy your developed apps in the cloud… or on-premise**

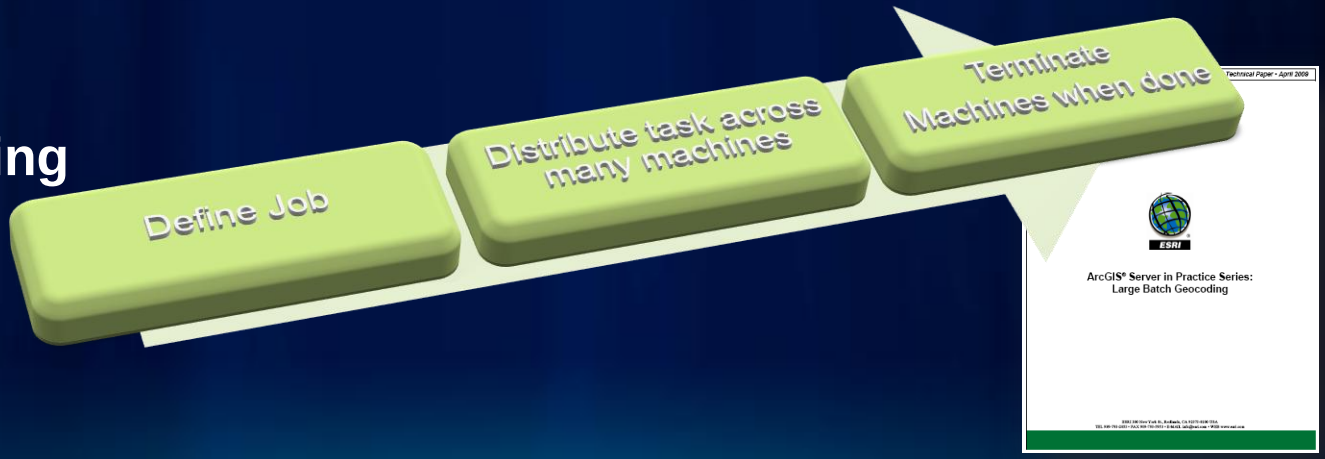
With ArcGIS 10, EDN customers can run ArcGIS Server in the Amazon cloud

Massive Ad-Hoc GIS Tasks

Are well suited for an environment with virtually unlimited computing power



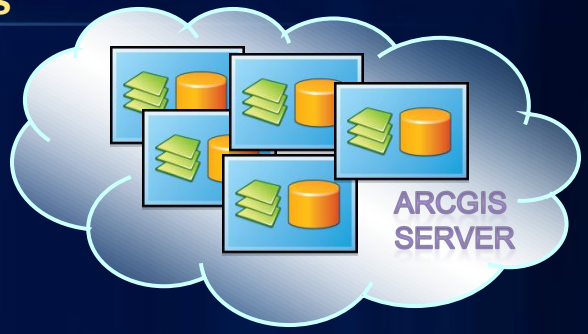
- **Massive Analysis:**
  - **Routing**
  - **Suitability Analysis**
  - **Geostatistics**
- **Map caching**
- **Batch geocoding**



Saves Money and Time

ArcGIS Server in Amazon for public Web Mapping sites

Appealing for low budget sites and highly popular ones



- Simplified deployment
- High bandwidth
- Secure
- Scalable
- Resilient

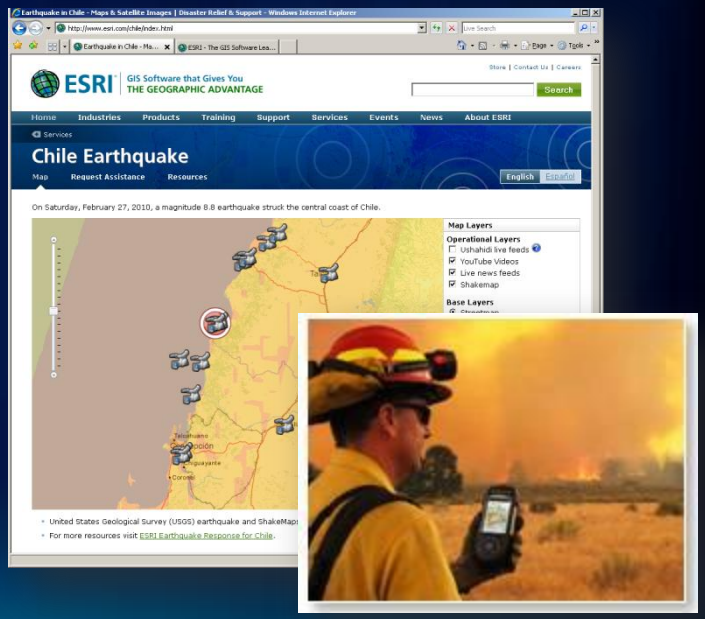
For small cities, large enterprises and others who cannot afford being down

ArcGIS Server in Amazon for Public Safety and Emergency Response

Up on the web in minutes. Replicated

- Simplified deployment
- High bandwidth
- Secure
- Scalable
- Resilient

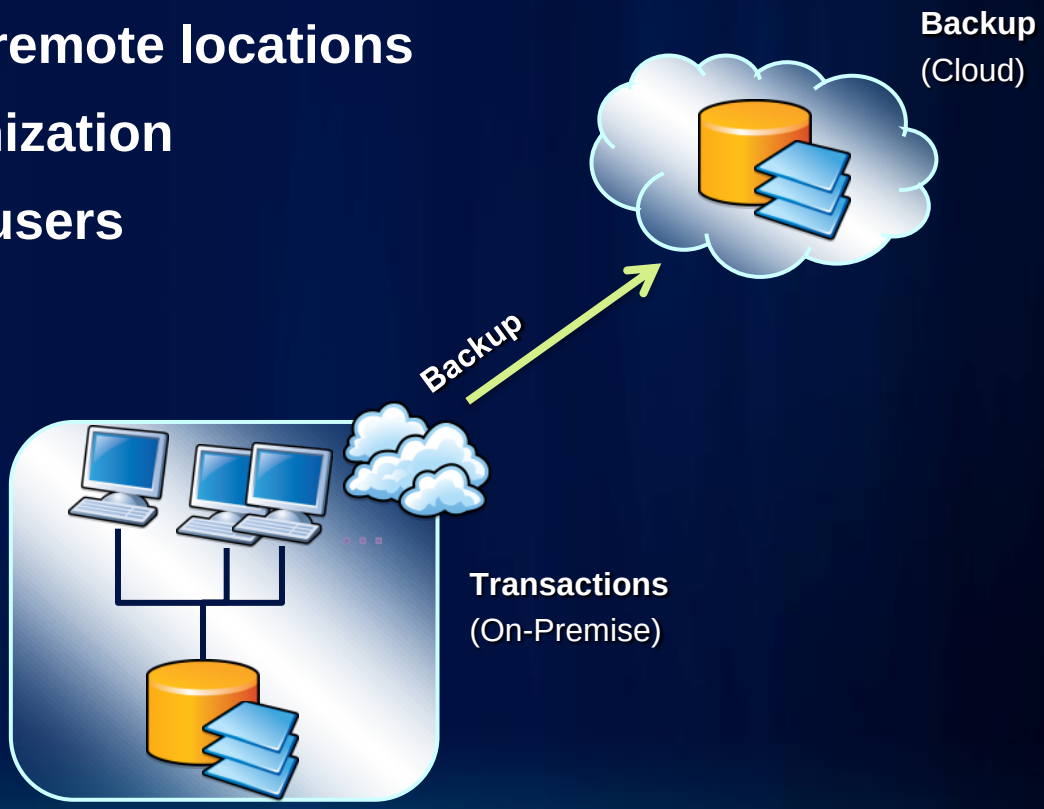
- With all the capabilities of ArcGIS Server
  - Web Mapping
  - Mobile access
  - Geocollaboration and VGI
  - Analysis…



Geodatabase back-up in the cloud

Secure storage of your geographic data for disaster recovery

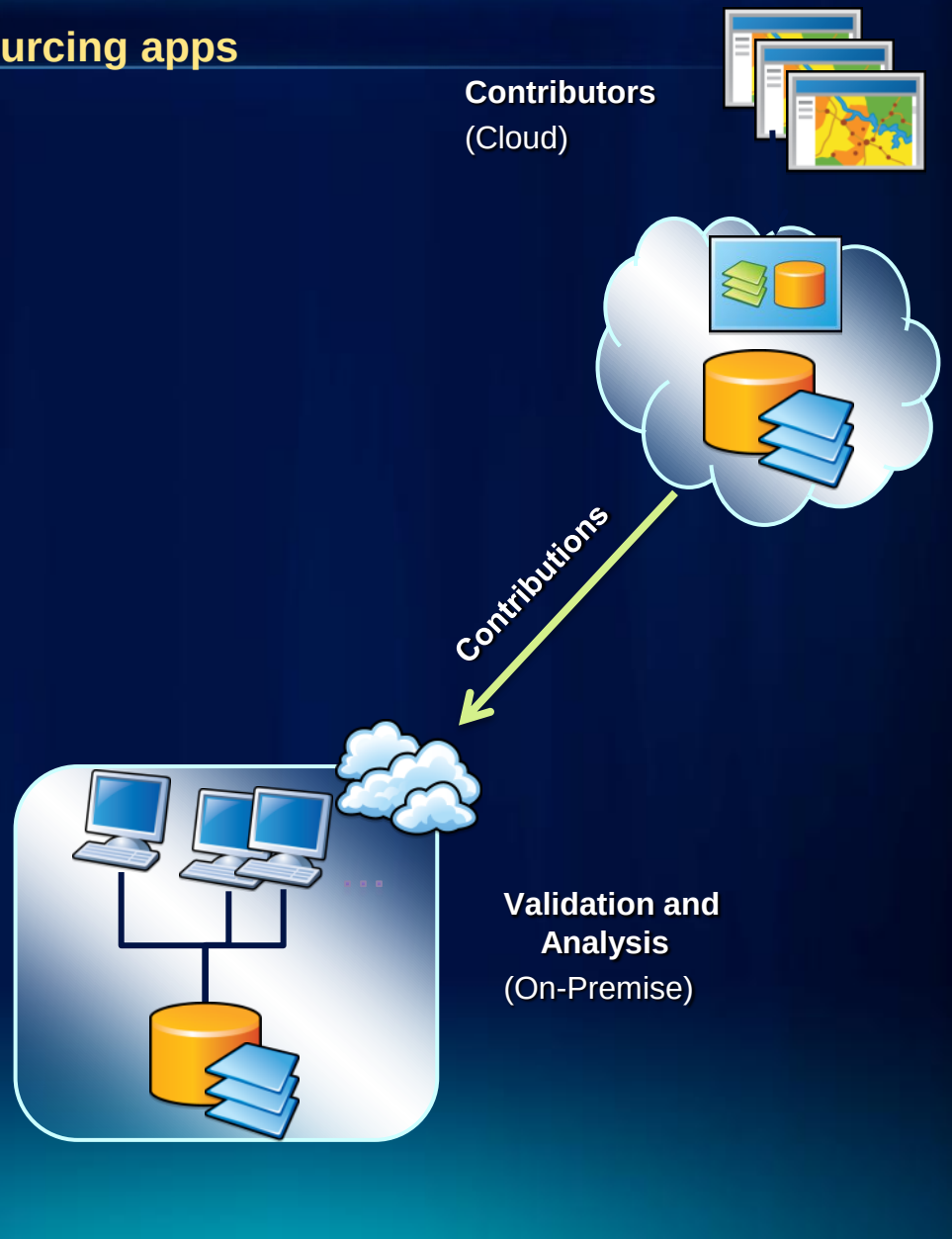
- Geodatabase storage on remote locations
- Secure periodic synchronization
- For ArcGIS Server Basic users



VGI applications

A deployment model for crowd sourcing apps

- **Secure**
- **Scalable**



ArcGIS Server Cloud Solutions

- **ArcGIS Server on Amazon EC2**: your pre-configured ArcGIS Server hosted by a Cloud provider and managed by you. No software installation and no hardware to maintain. Plus, you get full access to a range of Cloud services.

- **ArcGIS Server with Cloud Infrastructure**: your pre-configured ArcGIS Server hosted and managed by Esri. Fast deployment. No Cloud accounts to manage. And no set up fees. We take care of everything.

- **Esri Managed Services**: your custom solution for hosted Web mapping applications and services. Your design. Our expertise. Let us help you build the right Cloud solution for your organization

ArcGIS Server on Amazon EC2

- ArcGIS Server Amazon's Elastic Compute Cloud (EC2).
  - Use existing license
  - All you need is an Amazon Web Services account to get started.
  - Contact Esri Customer Service.
- ArcGIS Server on Amazon EC2 includes the following Amazon Machine Images (AMIs):
  - ArcGIS Server on Windows 2008
  - ArcGIS Desktop SP1 (for Server administration only)
  - A 100 GB drive for GIS Data
- Enterprise Geodatabase AMI
  - PostgreSQL Enterprise Geodatabase on Windows 2008
  - A 100 GB drive for storage of data.
- More info: ArcGIS Server on Amazon EC2 Resource Center.

ArcGIS Server with Cloud Infrastructure

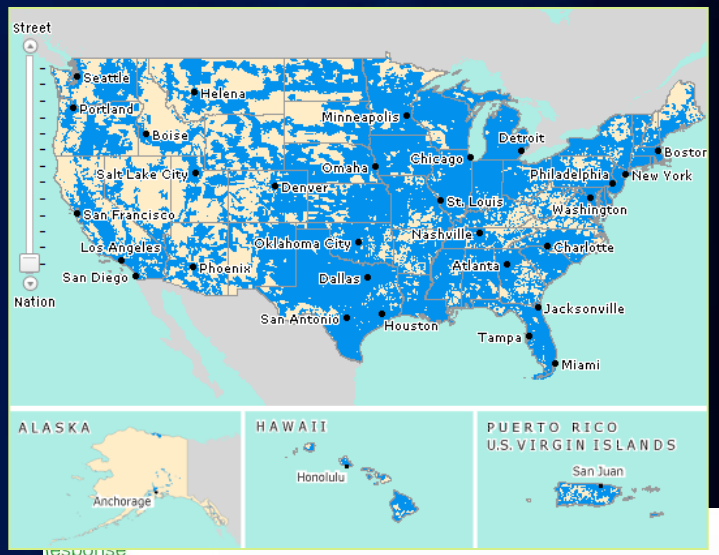
- ArcGIS Server 4-core Windows Server 2008 virtual machine in the Amazon EC2 cloud infrastructure.
  - 2.0 GHz processor per core
  - 15 GB of memory
  - 500 GB of storage
  - Microsoft Windows Server 2008 64-bit platform
- Cloud account management by Esri
- Available to U.S. customers only.
- No need to install or maintain software or manage Cloud accounts and no set up fees
- Software is always up-to-date
- 1, 3, and 12 month term licensing
- Documentation: deployment guide, best practices, and online help

Esri Managed Services: What do you get?

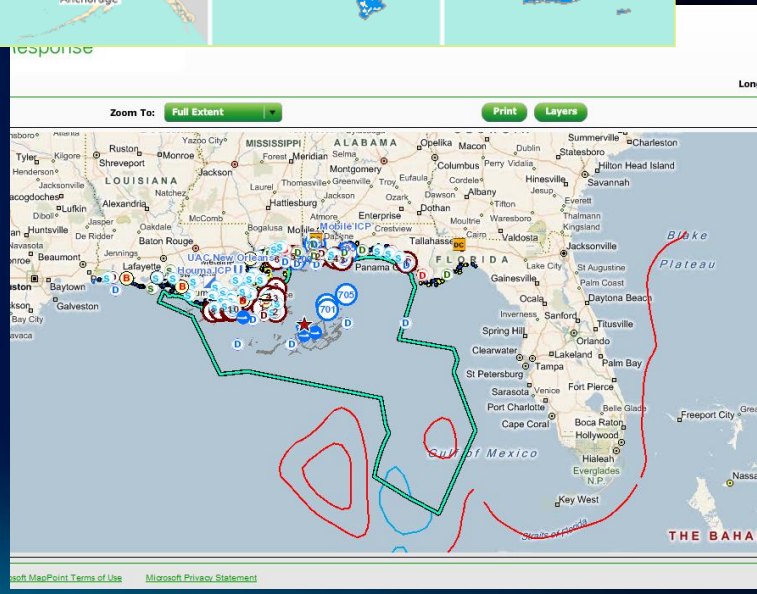
- Infrastructure
  - Facilities
  - Network
  - Security
  - Hardware
  - Software (ESRI and 3rd Party)
- Deployment
  - Staging
  - Production
- Data Management
  - Data Updates
  - Data Backup and Archive
- Technical Support and Monitoring
  - Tier 1 Helpdesk
  - Tier 2 Hosting Environment
  - Tier 3 Custom Application

Esri Managed Services - Examples

- **AT&T Coverage Viewer - High availability and heavy usage**
  - ArcGIS Server 9.3.1 JavaScript
  - Weekly Data Updates
  - ArcGIS Online & Weekly Data Update
  - 99.5% System Availability
  - 400,000 map requests per day max.



- **BP Gulf of Mexico Response Map - Fast deployment, scalable**
  - ArcGIS Server 10 Flex
  - Daily Data Updates
  - 99.9% System Availability
  - 90,000 map requests per hour max.



Thank You

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